could be dispensed with, the patient for several months has exhibited various hysterical symptoms, including convulsions, and is now attending the nervous dispensary of the University Hospital.

GUNSHOT WOUND OF BRAIN.

CASE V.—*(A. G.) Location of Bullet in Brain by X-ray Verified at Operation. Death on the Ninth Day. Autopsy Discovers Bullet One-Eighth Inch from Operative Counter-Opening.*

The injury was self-inflicted, terminating a debauch. The wound of entrance was at the angle of the right eye. The patient was unable to speak, though there was a little evidence of his understanding some of what was said to him. The right arm was paralyzed, and there was deviation of the tongue.

The X-ray plates printed in the illustrations were made on the admission of the patient to St. Joseph's Hospital within a couple of hours after the shooting. They confirmed the indications of injury to the left side of the brain, and located the bullet in a plane 1⅝ inches internal to the left side of the skull (Fig. 4), and 3⅛ inches below the vertex of the skull, and 5¼ inches posterior to the frontal eminence. (Fig. 5). The patient being prepared for operation, a trephine button was removed from the left side of the skull in accordance with these measurements, and a probe passed inward encountered the bullet on three different occasions. Attempted extraction by forceps proving futile, a little finger was inserted, but failed to recognize the bullet's presence. The patient was then turned over so that the operative wound was below, and an attempt was made to shake the bullet out. This was also ineffectual. The patient lived for nine days, being restless, but on no occasion having a convulsion; the temperature keeping between 97° and 99°, with the exception of one day, on which it mounted to 101°. The pulse was generally rapid and the respiratory rate was but slightly increased. The path of the bullet nearly traversed the brain. The operative wound for its removal completed the pathway, making an obtuse angle at the location of the bullet. Had the patient's head been turned with the counter-opening wound downward as soon as the latter was made, the prospects of the bullet's removal would have been increased. As it was, the bullet was sustained in the jelly-like consistency of the brain, and was easily dislocated and lost by the instrumental attempts at its removal.

CASE V.

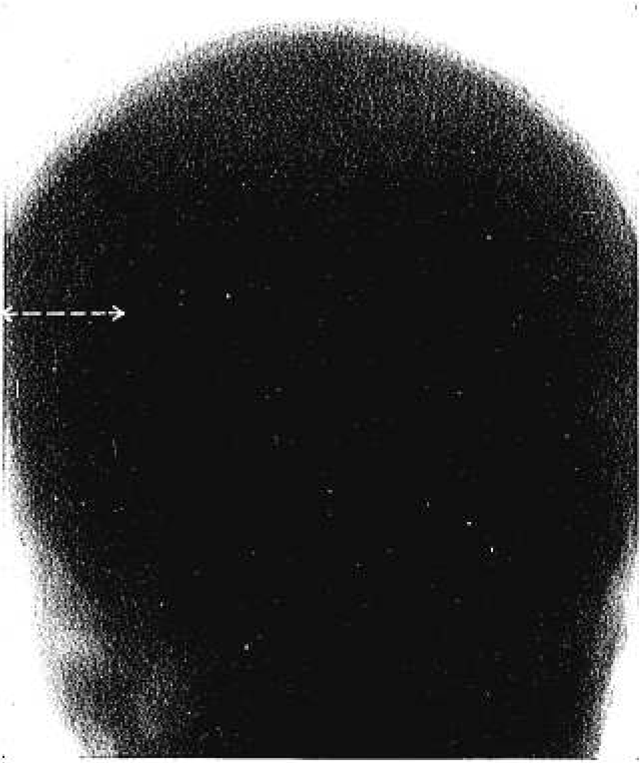
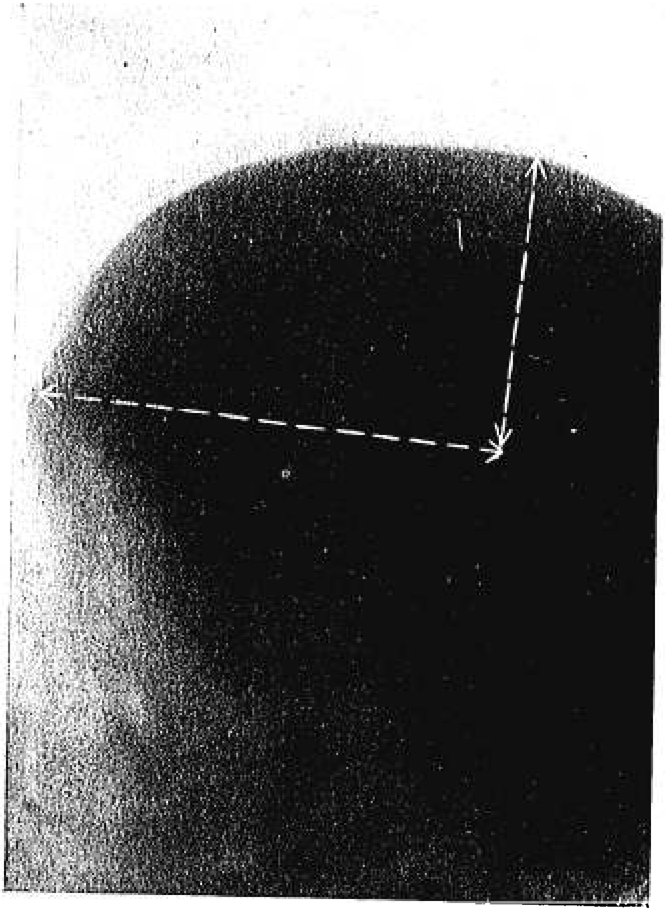


FIG. 4.—Bullet 1⅝″ internal to left margin of skull. (Radiograph by J. E. Roberts, M.D.)

CASE V.



Radiograph by J. E. Roberts, M.D.

FIG. 5.—Bullet. {5¼" posterior to frontal eminence.
3⅛" below the vertex.

At the suggestion of Dr. Addinell Hewson, the post-mortem examination of the pathway of the bullet was made by vertical transverse sections of the brain from before backwards.

The bullet after passing through the skull just outside the external angle of the orbit, immediately above the zygoma, entered the brain on the basal surface of the right frontal lobe, just in front of the temporo-sphenoidal lobe, two inches anterior to the central fissure, and one and one-quarter inches from the mesial surface of the right hemisphere, passing upward, backward, and to the left through the right lenticular nucleus, the anterior segment of the internal capsule, the caudate nucleus, the lateral ventricle of the right side, the septum lucidum, and the corpus callosum on the left side and then in to the left lateral ventricle, lodging at a site the plane of which was two inches posterior to the plane of the point of entrance. The position of the exploratory counter-opening, through which the bullet was touched at operation, was one inch posterior to the central fissure, and one inch above the plane of the fissure of Sylvius, in the lower post central convolution.

At autopsy, the bullet was removed from the site to which it had been dislodged in attempts at extraction. It was one-half inch posterior to the central fissure and one-half inch above the fissure of Sylvius; that is, one-half inch above the trephine opening, one-quarter inch posterior to it and one-quarter inch internal to the dura-mater. The original site of the bullet having been one and five-eighths inches internal to the skull.

Dr. Spellissy remarked that in the four cases of spinal luxation the injury resulted from great weight or force being suddenly applied to the head. The character of the injury was verified in the first and fourth cases by X-ray examination, and in the second and third by autopsy, the sites of injury being: in Case I, the lumbar-thoracic junction; in Case II, the third and fourth thoracic junction; in Case III, the sixth and seventh cervical junction; and in Case IV, the second and third cervical. In Cases II and III, there was gross injury to the cord, and death followed. Case II operated upon on the fifth day, became complicated by delirium-tremens and terminated on the nineteenth day, in no way improved by the operation.

Might immediate intervention have accomplished any more either for Case II or III? In Cases I and IV there was complete recovery. In Case I there were symptoms of cord injury, which disappeared with fixation and extension. In Case IV, there was only pain and muscular rigidity. He had successfully used the appliance employed in it in a case of cervical caries.

The apparatus (Figs. 6, 7 and 8) consists essentially of a pelvic band, united in front by a webbing strap. From the back of the band two uprights, equally distant from the median line, follow the contour of the back, neck and head to the level of the parietal eminences, where they turn at right angles and embrace the head, terminating on a line with the external angle of the eye. An occipito-mental headpiece is buckled with webbing straps fore and aft, on each side, to the horizontal arms of the uprights and affords effective extension of head and spine, when sufficient traction is made. A webbing band passing round the brow and buckling to the uprights of this bifurcated jury-mast just below their horizontal turn, fixes the head and prevents lateral movement. The use of webbing straps permits easier gradation of the degree of extension employed.

There is no doubt that some cases of cord injury can be benefited by immediate operation and that in others it is at least an unnecessary hardship if not an absolute injury. But whether as a routine practice in severe cases it is the most conservative measure to at once make an inspection of brain and cord is a question that is worthy of study by trial.

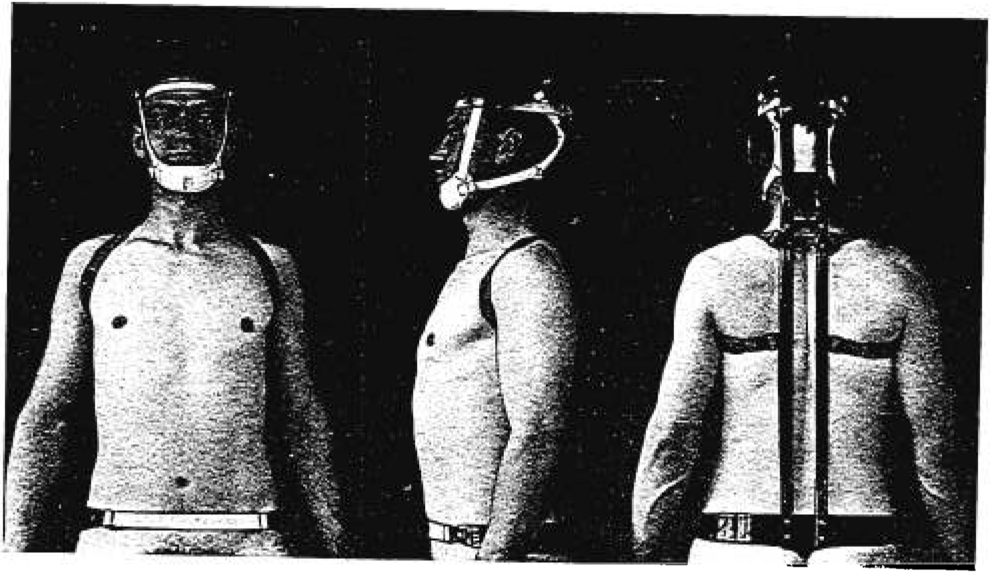
The report of the gunshot wound of the brain instances the accuracy of X-ray localization in these cases, a nine days survival of through and through brain injury, and the advisability of turning the counter-opening downward when probing and attempting extraction of bullets from the brain.

Dr. Alfred R. Allen said that he had studied microscopically the case (Harry M.) of spinal fracture dislocation.

The line of fracture was from above and posteriorly downward and anteriorly, the luxated vertebra tearing away the anterior superior lip of the body of the vertebra next below. The pathological material which he received was a part of the vertebral column, comprising six vertebræ above the fracture-dislocation and two vertebræ below.

A section of the spinal cord at the highest level of that particular specimen indicated from the relationship of gray and white matter that it was a thoracic segment. Now if it be

CASE IV.



Figs. 6, 7, 8. Front, side and back of cervical spine extension, steel and hard rubber brace.

CASE II.

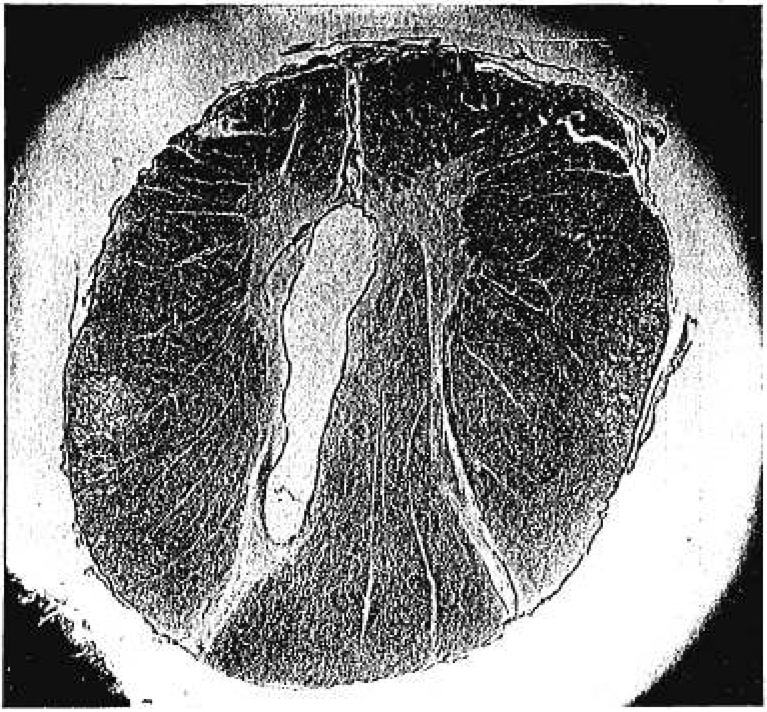


FIG. 9.—A section of the spinal cord in the thoracic region showing an area of softening in the gray matter, as well as an area of traumatic myelitis on each side in the anterior part of the direct cerebellar tract. Section stained by Weigert method. (Photo-Micrograph by A. R. Allen, M.D.)

allowed by way of argument, that the highest level of the specimen was the first thoracic segment—and that is the highest it could possibly be—then the fracture-dislocation involved most probably the fifth and sixth thoracic vertebra, crushing thereby the lower part of the seventh and upper part of the eighth thoracic segments of the spinal cord. This is a little lower than Dr. Spellissy thought at the time.

There was one interesting finding in this cord: an area of central softening (Fig. 9) extending from about 2 to 6 cm. below the level of fracture. That central area of softening, had he been able to examine every section serially, would probably have revealed a damaged blood vessel, possibly two or three, in relation to it. Traumatic hematomyelia is due to a purely hydraulic action in one or more of the branches from the anterior spinal artery within the anterior median fissure.

The question that Dr. Spellissy brought up as regards operation in these cases is one on which neurologists and surgeons will never agree, until some means is discovered by which the surgeon can say with a reasonable amount of assurance, "I can, by this method, so successfully bridge over the injured portion of the spinal cord that there will be functional continuity." That of course is a perfect impossibility as yet. In the first place there is an absence of neurilemma nuclei in the spinal cord and on these neurilemma nuclei is regeneration supposed to depend. In going over records of hundreds of cases he had been impressed by the fact that those cases which have had expectant treatment have had as high a percentage of would-be cures as those operated upon.

Dr. Richard H. Harte said that the manner of dealing with these cases of spinal injury is the point which interests surgeons. A man falls from a roof, or something falls on him, and he is forcibly bent forward, the vertebra gives way at the vulnerable point, the juncture of the first lumbar and last dorsal, and as a result there is in all probability a partial dislocation, and a fracture possibly of the lip of the upper or lower portion of the body of the vertebra. Now the question comes up, what are we going to do with these cases? As a rule they are fatal. If there is a certain amount of pressure on the cord without any destruction of the cord substance the sooner that pressure is removed the better the chances of recovery. On the other hand, if there is a certain amount of pressure on the cord, and it is not relieved, the patient being treated expectantly, the cord will in a short time degenerate, and then there is very little to be expected in the way of recovery. It seemed to him if he were in a position where he had a fracture of the spinal column and had to decide the question whether he would rather lie on a water bed for a time and then die as the result of bedsores, cystitis, etc., or have his neural canal opened and dealt with, he should certainly take the chances and have his canal opened. He thought that on the whole, if one gets one per cent. of recoveries one is fortunate.

He recalled one case where he did an operation for this condition. The man had a fracture of the lower portion of his spinal column and he is now putting up gutters and tin roofs through the country!

He had opened many canals with indifferent results, but on the whole he thought this procedure offers to the majority of cases the best chance of recovery. He could not see, in these cases, what was to be gained by treating them expectantly. By waiting a degeneration of the cord is likely to occur, and when that occurs, as the result of pressure, little can be later accomplished by going into the neural canal. He had tried both ways, and while the results are not brilliant in either, he had obtained better results by promptly relieving the pressure.

Dr. Alfred R. Allen said that it was doubtful whether in fracture-dislocation of the spinal column, the degeneration of the cord which is found in cases which have lived some time after the accident, is due to unrelieved pressure. He mentioned a case of gunshot wound where the bullet impinged instantaneously on the dura, not enough to even ruffle the surface. A laminectomy revealed the cord apparently normal. The case died, and the cord at autopsy was found to be just like jelly for at least three centimeters. In this case there was a pressure which had been brought to bear and then instantly removed, and yet there was complete degeneration.

PUNCTURED FRACTURE OF THE SKULL.

Dr. George G. Ross read a paper with the above title, for which see page 108.

Dr. Addinell Hewson said that in view of the statement made by Dr. Ross that the cerebral abscess is often not recognized,